**TUTORIAL (FOT THE FIRST MIDTERM)**

Q1. Consider the following load raising system. Wire rope is rounded on the drum from right to left and from left to right. The shaft is made of steel with S_y=680 MPa, S_{ut}=1000 MPa and E=207 GPa.
   (a) Calculate the power of the motor if the load is to be raised at a constant speed of 0.5 m/s.
   (b) Determining the critical section, determine factor of safety by using,
        - Maximum shear stress theory of failure (MSST)
        - Distortion energy theory of failure (DET).

F=500 kg = 5kN
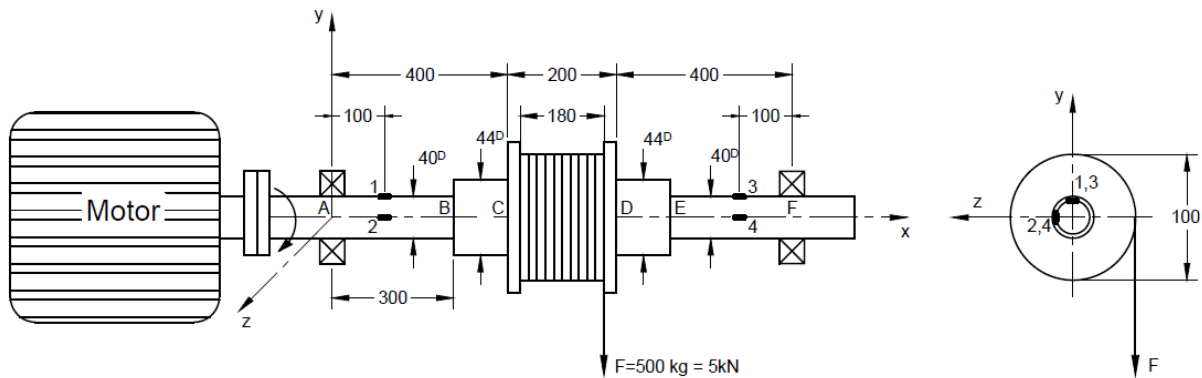
Q2. A 3.5m long, column of rectangular cross section (w x t) with both ends are fixed must be able to carry a maximum load of 200 kN. Assume that w=5t. The material is steel with Su=800 MPa, Sy=700 MPa and E=207 GPa.

   a) What minimum dimensions of the cross section are permitted without having failure?
   b) Repeat part (a) if circular cross section is used (what would be the min. diameter).
   c) In your opinion which one (rectangular or circular cross section) should be preferred? Why?
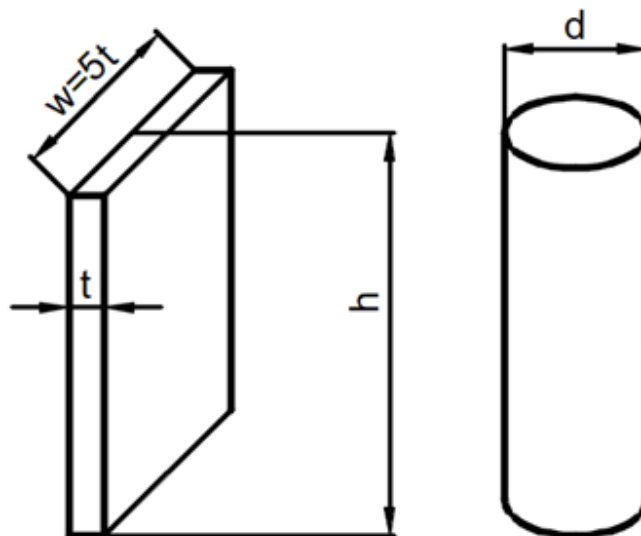
Q2. Drive an expression for vertical deflection at point B (y_B) by using Castigliano's theorem.